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CYPRESS SEMICONDUCTOR

CYPRESS SEMICONDUCTOR INVENTION DISCLOSURE FORM

DISCLOSURE NO. IC99001

1. INVENTOR(S)

- A. Name I-Teh Sha Initials [REDACTED] Empl. No. [REDACTED] Ext. No. [REDACTED]
Citizenship Taiwan Dept # [REDACTED] Home Phone No. [REDACTED]
Home Mailing Address 1901 Halford Ave. Apt # 100 Santa Clara, CA 95051
- B. Name Kuang-Yu Chen Initials [REDACTED] Empl. No. 9125 Ext. No. 1115
Citizenship USA Dept # [REDACTED] Home Phone No. [REDACTED]
Home Mailing Address 20489 Chalest Lane, Saratoga, CA 95070
- C. Name Albert Chen Initials [REDACTED] Empl. No. [REDACTED] Ext. No. [REDACTED]
Citizenship Taiwan Dept # [REDACTED] Home Phone No. [REDACTED]
Home Mailing Address 13901 River Ranch Circle, Saratoga, CA 95070
- D. Name [REDACTED] Initials [REDACTED] Empl. No. [REDACTED] Ext. No. [REDACTED]
Citizenship [REDACTED] Dept # [REDACTED] Home Phone No. [REDACTED]
Home Mailing Address [REDACTED]

2. TITLE OF INVENTION: **DECREASING PLL OVERSHOOT OR DURING A
FOR SPREAD SPECTRUM TRANSITION**

3. CONCEPTION OF INVENTION

- A. Date of first drawing or drawings [REDACTED]
Where can first drawing be found? Engineering notebooks
- B. Date of first written description [REDACTED]
Where can description be found? Engineering notebooks
- C. Date of first oral disclosure to others [REDACTED]

To whom? Kuang-Yu Chen

Inventor(s) I. T. Sha Date 7/30/99

Inventor(s) Kuang-Yu Chen Date 7/30/99

Inventor(s) Albert Chen Date 7/30/99

Witnessed, Read, and Understood by: [REDACTED] Date [REDACTED]

Witnessed, Read, and Understood by: [REDACTED] Date [REDACTED]

(Each page upon which information is entered should be signed and witnessed.)

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4. CONSTRUCTION OF DEVICE

- A. Date completed _____
B. Was prototype made? _____
C. By whom made? _____
D. Where can the prototype be found? _____

5. TEST OF DEVICE

- A. Date: _____ Witness(es): Kuang-Yu Chen
B. Results: Successful

6. SALE

- A. Was invention sold or offered for sale? Yes _____ No X
B. Was invention used to make, assemble or test a commercial product? Yes X No _____
C. Will invention be sold, offered for sale, sampled, or used to make, assemble or test a commercial product?
Yes X No _____
D. Actual or estimated date of first sale, offer or commercial use _____
E. Is invention part of a product for which there is a data sheet? Yes X No _____ (if yes, attach a copy of the data sheet)
F. Actual or estimated date of publication, release or availability of data sheet November 1998

7. USE

- A. Is invention presently being used? Yes X No _____
B. Are there specific plans for its use in near future? In what products or processes?
The whole invention has been implemented in the [redacted] family.

8. RELATED PUBLICATIONS, PATENTS, AND PATENT APPLICATIONS

9. WAS INVENTION: Conceived (Yes X (No _____ Constructed (Yes X (No _____ Tested (Yes X (No _____ during performance of Government Contract?)

Inventor(s) [Signature] Date 7/30/99
Inventor(s) [Signature] Date 7/30/99
Inventor(s) Albert Chen Date 7/30/99

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CYPRESS SEMICONDUCTOR INVENTION DISCLOSURE FORM

Contract Number _____

(Give Full Contract Number)

The description of invention should be written in the inventor's own words and generally should follow the outline given below. Sketches, prints, photos, and other illustrations, as well as memos or reports of any nature in which the invention is referred to, if available, should form a part of this disclosure and reference and be made thereto in the descriptions of the invention's construction and operation.

FOR ANSWERS TO THE FOLLOWING QUESTIONS, USE THE REMAINDER OF SHEET AND THE ATTACHED SHEET(S).

1. General purpose of invention. State in general terms the objects of the invention.

To decrease the overshoot or undershoot in a PLL's frequency during the turn on or turn off of spread spectrum. This invention solves unpredictable transition period which could cause a CPU to hang when the spread spectrum transitions on or off.

2. Describe old technology, if any, for performing the function of the invention. Provide references, if available.

This problem has never been solved.

3. Indicated the disadvantages of the old technology.

No solution has been considered to spread spectrum transition behavior. Most of time, the transition happens unpredictably. Now it is controllable by programming and circuitry

4. Describe your invention and its construction, showing the changes, additions and improvements over the old method.

Inventor(s) *W. Teh Shi* Date *7/30/99*

Inventor(s) *Ken Y. Ch* Date *7/30/99*

Inventor(s) *Albert Chen* Date *7/30/99*

Witnessed, Read, and Understood by: _____ Date _____

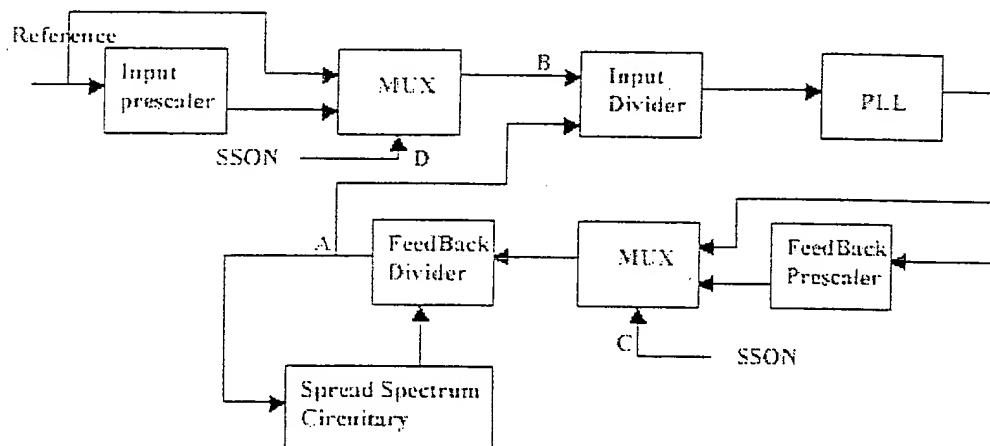
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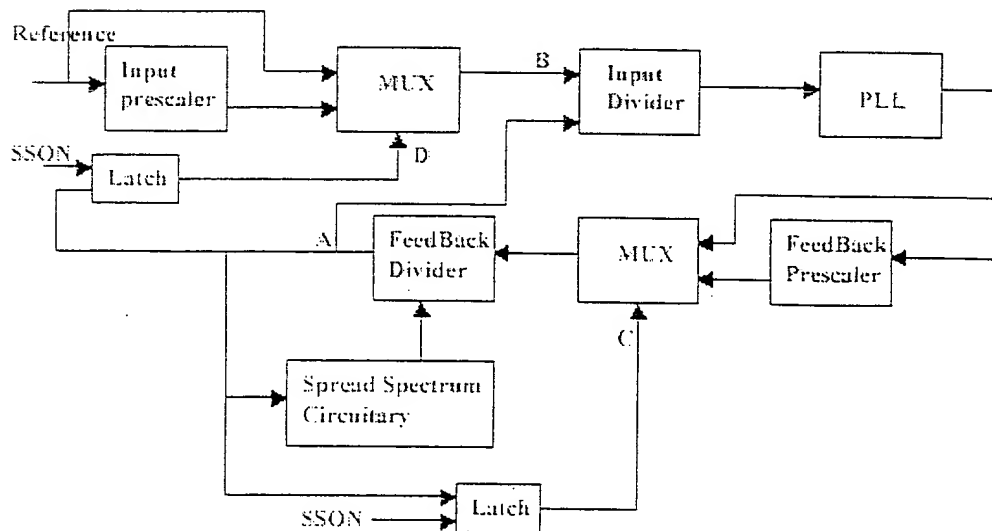
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I. Schematic

OLD



NEW

Inventor(s) W. F. H. Shu Date 7/30/99Inventor(s) Kun-H. Ch Date 7/30/99Inventor(s) Albert Chen Date 7/30/99

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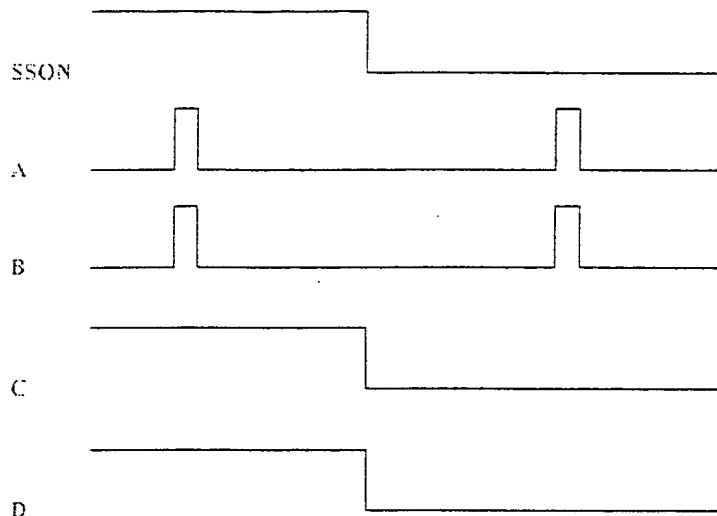
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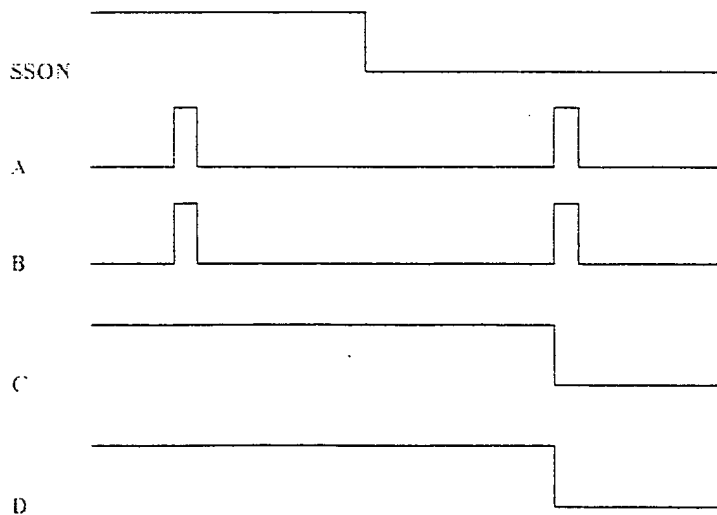
CYPRESS SEMICONDUCTOR INVENTION DISCLOSURE FORM

2. Timing Diagram

OLD



NEW



Inventor(s) W. J. Chen Date 7/30/99
 Inventor(s) Albert Chen Date 7/30/99
 Inventor(s) Albert Chen Date 7/30/99

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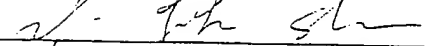
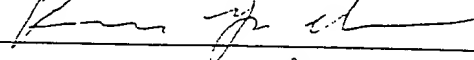
3. Formula

A. Using the following formula to generate Spread Spectrum ROM code

$$\begin{bmatrix} X_0(N+1) \\ X_1(N+1) \\ X_2(N+1) \\ X_3(N+1) \end{bmatrix} = \begin{bmatrix} 0 & -\frac{FBD(N+1)}{C} & 0 \\ \frac{CP}{C} & -\frac{1}{C_1 \cdot R_1} & \frac{1}{C_1 \cdot R_1} \\ 0 & \frac{1}{C_2 \cdot R_1} & -\frac{1}{C_2 \cdot R_1} \end{bmatrix} \begin{bmatrix} X_0(N) \\ X_1(N) \\ X_2(N) \end{bmatrix} + \begin{bmatrix} C_0(N+1) \\ U_1(N+1) \\ U_2(N+1) \end{bmatrix} + \begin{bmatrix} X_0(N) \\ X_1(N) \\ X_2(N) \end{bmatrix}$$

R₁=40 k at SSCG offR₂=24 k at SSCG onU₁(N) is changed when SSCG switches OFF-ON or ON-OFF

B. Input FBD(N) to PLL's transient program that optimize the FBD(N) order in ROM address.

C. Inventor(s)  Date 7/30/99Inventor(s)  Date 7/30/99Inventor(s) Albert Chen Date 7/30/99

Witnessed, Read, and Understood by: _____ Date _____

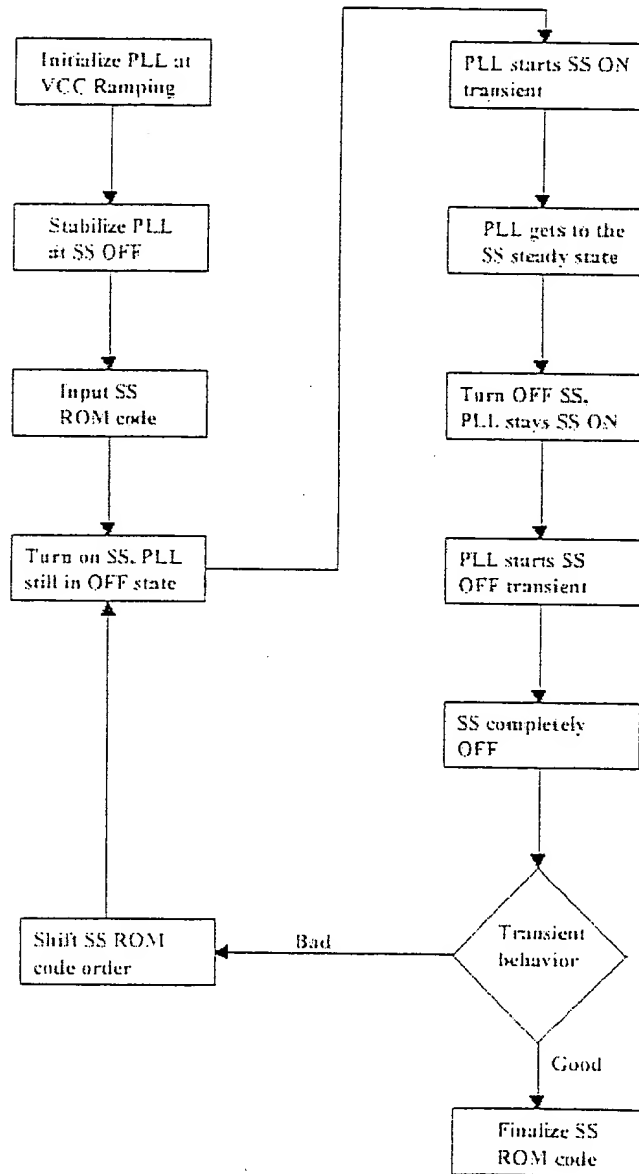
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4. [REDACTED]



Inventor(s) *J. F. de* Date *7/30/99*
 Inventor(s) *Kunip ch* Date *7/30/99*
 Inventor(s) *Albert Chen* Date *7/30/99*

Witnessed, Read, and Understood by: _____ Date _____

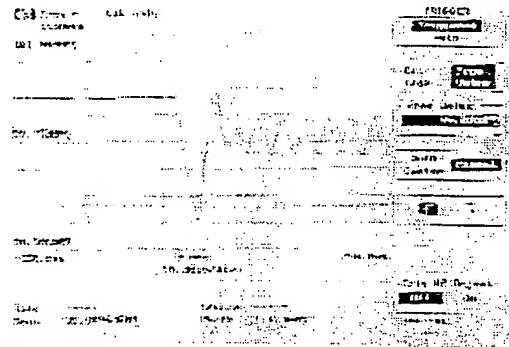
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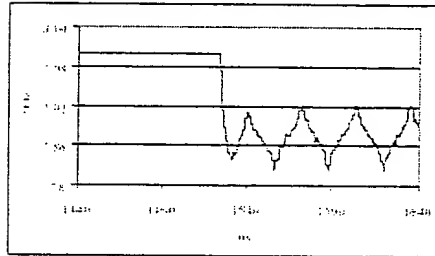
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5. Simulated and measured results

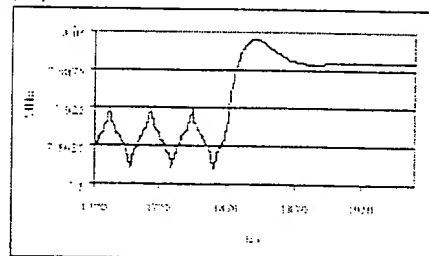


PLL's undershoot and overshoot behavior in spread spectrum transition

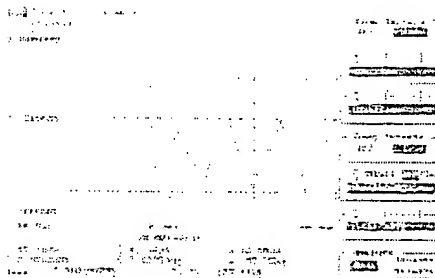
Spread Spectrum transition behaviors are controlled by the program



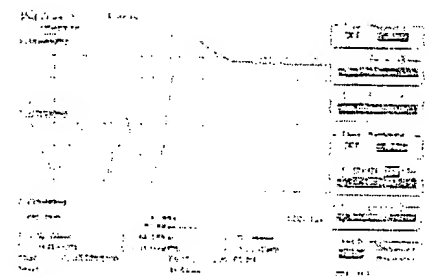
(a)



(b)



(a)



(b)

(a) Simulation (b) Measured results in on-to-off transition (a) Simulation (b) Measured results in on-to-off transition

Inventor(s) W. H. Chen Date 7/30/99
 Inventor(s) Albert Chen Date 7/30/99
 Inventor(s) Albert Chen Date 7/30/99

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5. Give details of its operation (i.e., how is your invention used?), if not already described under 4.
6. State the advantages of your invention over what has been done before.

The transient behavior of a spread spectrum can be fully controllable. It prevents PLL's overshoot or undershoot from switching ss on or ss off.

7. Indicated any alternate component(s) and/or method(s) of construction.
8. If a joint invention, indicate what contribution was made by each inventor.

I-Teh Sha

Implement pll's steady state and transition model

Kuang-Yu Chen

The concept of ROM code shifting to improve SSCG's transition behavior

Albert Chen

Synchronized circuitry and layout implement.

9. Describe the features that are believed to be new.

1. FORTRAN program is used to determine transient and steady-state spread spectrum behavior.
2. All dividers and prescalers are synchronized.
3. Transient behavior is simulated starting from steady-state condition

10. State opinion of relative value of invention.

This invention will apply to most of the existing spread spectrum devices. For spread spectrum applications, all EMI reduction chips need to add this invention in order to avoid CPU clock tracking failure during spread spectrum on-off or off-on transition.

11. After the disclosure is prepared, it should be signed by the inventor(s) and then read and signed by two witnesses in the space provided at the bottom of each sheet.

Inventor(s) I-Teh Sha Date 7/30/99

Inventor(s) Kuang-Yu Chen Date 7/30/99

Inventor(s) Albert Chen Date 7/30/99

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